Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Noise Fluctuations and Avalanche Statistics of Skyrmions with Quenched Disorder SEBASTIAN DIAZ, Department of Physics, University of California, San Diego, CYNTHIA OLSON REICHHARDT, CHARLES REICHHARDT, AVADH SAXENA, Theoretical Division and Center for Nonlinear Studies, Los Alamos National Laboratory — Magnetic skyrmions are nanoscopic magnetic textures that enjoy topologically-protected stability and exhibit particle-like behavior. Their novel transport properties have generated extensive basic research and show great potential for using skyrmions as information carriers in future high-density magnetic storage and logic devices. At the particle level, both magnetic skyrmions and superconducting vortices - another kind of topological excitations that also behave as particles - admit a common theoretical description. While in real materials, superconducting vortex dynamics is dissipation-dominated, the so-called Magnus force dominates the dynamics of magnetic skyrmions. Using a particle-based model, we simulate two different systems in the presence of quenched disorder: velocity noise fluctuations of current-driven skyrmions and avalanche statistics of flux-driven skyrmions. We obtain the power spectral density, dynamical phase diagram, as well as the avalanche critical exponents as a function of the Magnus force strength. Our results show that both the noise and avalanche properties of skyrmions depart significantly from the known case of superconducting vortices.

Sebastian Diaz
Department of Physics, University of California, San Diego

Date submitted: 09 Nov 2016 Electronic form version 1.4